SCIENCE

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THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY AND HARVARD UNIVERSITY.

THE proposed affiliation or alliance of the Massachusetts Institute of Technology with Harvard University was, as we have already reported, approved at a meeting of the corporation of the institute on June 9. Thirty-two of the forty-seven members of the corporation were present, and by a vote of 20 to 12 it was agreed to accept the terms of the agreement drawn up by the committee of the two institutions. Before the agreement can become effective the corporation and overseers of Harvard University must take action and several legal questions must be passed upon by the courts. It will be remembered that on May 5 the faculty of the institute adopted by a vote of 56 to 7 the report of the committee adverse to the affiliation. A full account of the report adopted by the faculty and of the minority report, together with an account of the meeting of the alumni on May 4 has been published in a special issue of *The Technology Review*.

In view of the great importance of the proposed merger for university development and technological education we reproduce here: (1) The agreement prepared by President H. S. Pritchett and Professor A. Lawrence Lowell on behalf of the institute and Dr. H. P. Walcott and Charles Francis Adams, 2d, Esq., on behalf of the university, now adopted by the corporation of the institute; (2) the will of the late Gordon McKay in so far as it relates to his bequest to Harvard University,

and (3) extracts from the report adverse to the alliance adopted by the faculty of the institute and extracts from the minority report.

AGREEMENT BETWEEN HARVARD UNIVERSITY AND THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY.

Harvard University and the Massachusetts Institute of Technology, being convinced, after a careful consideration of the conditions which affect the work of education in industrial science, that such work can be greatly advanced and enlarged by a cooperation of the two institutions, in order to secure mutual assistance, render possible a larger enterprise, promote economy, avoid duplication and competition, and give to the purpose of donors who have bestowed money in trust for that object a fuller accomplishment, do make this agreement, which shall endure so long as it shall be found to serve, to the satisfaction of both institutions, the objects above declared. But, whereas the carrying out of such agreement will require the employment of the income of the funds which the University holds, or will hereafter hold in trust, and the University feels that faithfulness in the performance of these trusts which it has accepted is its first duty, to which all other considerations must yield, this agreement shall not go into effect until and unless the University shall have applied to the Supreme Judicial Court for instructions and the court shall have made a decree that this agreement may be carried out without violation of its duties as a trustee and in accordance with law and equity.

I.

The organization of the University, the organization of the Institute, and the title of each to its property and funds shall remain unaffected by this agreement, as shall also the rights and duties of each in investing and managing its funds.

II.

The institution for the combined work of promoting and furnishing education in industrial science, which it is the object of this agreement to establish, shall retain the name of the Massachusetts Institute of Technology; it shall be under the direction of an Executive Committee, and the instruction therein shall be given by a Faculty, which two bodies shall be constituted as herein below provided.

III.

The said Executive Committee shall consist of nine persons, to be designated by the Massachusetts Institute of Technology, of whom two shall be the President of the Corporation of the Institute and the Treasurer of the Institute, and three shall be members of the Corporation of the University.

Subject to the restrictions herein below expressed, the said Executive Committee shall have the general administration and superintendence of all matters concerning said combined work, including the appointment of officers of instruction and government, and of servants, the power to remove any of them, the fixing of their salaries and the prescribing of their duties, the care of buildings, property, and equipment, the appropriation of money put at its disposal under this agreement, the fixing, collecting, and expending of students' fees, and the supervision and direction of the work of the Faculty, these being substantially the powers now conferred on the Executive Committee of the Institute by its by-laws; it being, however, expressly provided that all appropriations from money furnished either by the University or by the Institute, and all proposed appointments or removals of officers whose salaries are to be paid

therefrom, shall be submitted to the Corporation concerned and approved by it before being finally adopted, it being understood that students' fees shall be deemed to be furnished by the Institute, and that no change shall be made in those fees without its approval.

The said Executive Committee shall keep records of its proceedings, and shall make reports to the Corporation of the University and the Corporation of the Institute annually, and at such other times as either Corporation may request.

IV.

The President of the Institute for the time being shall be the President of the said Executive Committee, and shall preside at its meetings, when present. His salary, as fixed by the Corporation of the Institute, shall be paid from the funds furnished by the Institute. He shall be the Chairman of the Faculty, shall have the superintendence of the several departments, and shall act as general executive and administrative officer, subject to the direction and control of said Executive Committee. He shall annually make a report to the Corporation of the University and to the Corporation of the Institute. Whenever a person shall vacate the office of President of the Institute, he shall thereupon cease to be a member of the said Executive Committee.

V.

The Treasurer of the Massachusetts Institute of Technology shall be *ex officio* the Treasurer of the said Executive Committee. He shall, as Treasurer of the said Executive Committee, have charge of the funds put at the disposal of said committee, shall make such payments as the committee may authorize, shall keep accurate accounts of all money received and expended, and shall make report of his doings annually, or oftener if required, to the said committee, and to the Corporation of the University and to the Corporation of the Institute.

VI.

The Faculty shall consist of all the present professors, associate professors, and assistant professors of the Institute, and all professors, associate professors, and assistant professors of the University who now give courses of instruction leading to degrees in industrial science, and such officers hereafter appointed as said Executive Committee may designate. The present professors, associate professors, and assistant professors of the University as aforesaid shall not be removed nor have their present salaries reduced without the consent of the Corporation of the University.

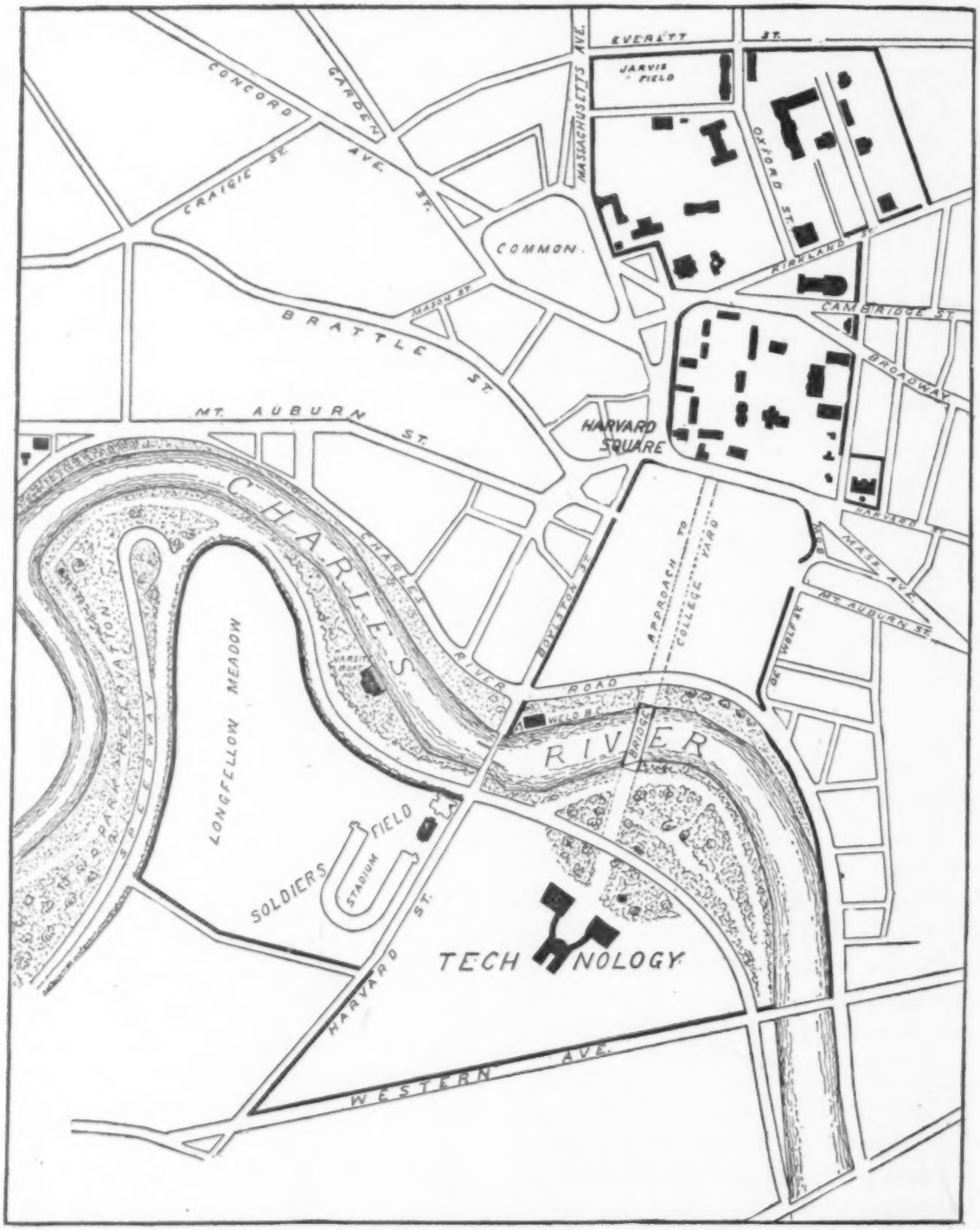
Subject to the supervision and direction of the said Executive Committee the Faculty shall have charge of instruction and discipline.

VII.

Subject to the reservations hereinafter set forth the University shall place at the disposal of said Executive Committee, as above provided, the net income of all funds which are now credited on its books to the credit of the Lawrence Scientific School, also the use of all machinery, instruments, and equipment which the University holds, and the income of all property which it may hereafter acquire for the promotion of instruction in industrial science, and also three fifths, but no more, of the net income which may accrue from the bequest and devise of the late Gordon McKay.

VIII.

Subject to the reservations herein set forth, the Institute shall place at the disposal of the said Executive Committee the net income of all funds and the use of all property and equipment which the Institute may hold for the promotion of instruction in industrial science, reserving only



Map showing the proposed site of the Massachusetts Institute of Technology and its relation to Harvard University. (From the Boston *Transcript*.)

such amounts and property as it may require to maintain its organization and to carry on such functions as may remain to it independently of the promotion of industrial science.

IX.

In so far as money contributed by either Corporation under this agreement may be used by the said Executive Committee for the purchase of equipment or supplies, the

title thereto shall be in the Corporation whose money is appropriated therefor.

X.

The site of the institution shall be in Boston on the right bank of the Charles River, as nearly as practicable opposite to Harvard Square, and the Massachusetts Institute of Technology shall there erect, furnish, and equip buildings having the capacity of at least its present buildings. But the Institute shall not be required to proceed with such purchase and construction until it shall have sold a sufficient part of the land which it now owns. Provided, however, that this agreement shall be avoided if at the end of four years from the time when this agreement goes into effect the Institute shall not have purchased said land and proceeded to a substantial extent with such construction.

XI.

Within three years after the Massachusetts Institute of Technology begins the construction of such new buildings, if the Institute is then prepared to give in its new location to the students of the Lawrence Scientific School all needed instruction in industrial science, the Lawrence Scientific School shall be discontinued as a separate school of industrial science so long as this agreement remains in force.

XII.

The degrees of Bachelor, Master and Doctor in Science, so far as given in industrial science, and all degrees in engineering, together with the requirements of courses of study leading to these degrees, shall be within the province of the Faculty; and these degrees shall be conferred by the Corporations of the University and the Institute, acting separately.

XIII.

Male students in the Institute shall have the same privileges as students in Harvard University in the use of the playgrounds, museums, and libraries of the University.

Under regulations to be made by the two Corporations, and on payment of proper fees, students of the Institute shall be admitted to courses of instruction and the use of laboratories of the University, outside of those pertaining to industrial science, and students of the University to the courses and use of laboratories of the Institute.

XIV.

The Corporation and Overseers of the University and the Corporation of the Massachusetts Institute of Technology shall each have full right at all times to inspect the institution, and suggest to the said Executive Committee changes in the methods of management.

XV.

The Department of Architecture in the University and in the Institute respectively are not included in this agreement, but remain unaffected hereby.

XVI.

It is expressly provided that, as regards the funds and property of the University and of the Institute respectively, this agreement shall be subject to any special terms and requirements upon which such funds and property may be held; and any property or funds which may be held at any time by either Corporation under such terms and restrictions as would prevent the use of them in the precise manner contemplated by this agreement shall, nevertheless, be used by the two Corporations respectively for the support, benefit, or encouragement of the scheme agreed upon, in such manner as may be permissible and in accordance with the trusts upon which they may be held.

XVII.

The arrangements established by this agreement may be terminated at any time

either by the President and Fellows of Harvard University or by the Corporation of the Massachusetts Institute of Technology, upon reasonable notice to the other Corporation.

In the event of the termination of this agreement, the Massachusetts Institute of Technology must pay, at such prices and upon such terms as the parties may agree upon, and, if they can not agree thereon, as may be fixed by arbitration (usual arbitration clause), for any buildings or fixtures upon said site, paid for with funds furnished by the University.

XVIII.

This agreement shall take effect when finally adopted and approved by the Corporation and the Overseers of the University and the Corporation of the Institute, and when and if a decree of the Supreme Judicial Court, as provided for in the preamble hereof, shall have been obtained.

EXTRACT FROM THE WILL AND CODICILS OF THE LATE GORDON McKAY.

I direct that eighty per cent. of the balance of said net annual income, after paying the annuities (the remaining twenty per cent. being held as a reserved fund to cover any future possible deficiency in the annual income to pay said annuities), shall be safely invested by my trustees from time to time until such accumulations amount to the sum of one million dollars, and then I direct my trustees to pay over said sum of one million dollars to 'the President and Fellows of Harvard College in their corporate capacity,' if said Corporation shall accept the same for the purposes and upon the terms and conditions hereinafter set forth, to be held and applied by them and their successors in said capacity for the purposes and trusts hereinafter declared.

I also direct said trustees to pay to the said President and Fellows (if and after said sum of one million dollars has been paid over to them, as aforesaid) annually eighty per cent. of the balance of the net income accruing from the remainder of my estate after paying the existing annuities; and upon and after the death of the last surviving annuitant I direct said Trustees to pay over to the said President and Fellows of Harvard College all the residue of my estate, including all unexpended income, all of which said sums I give to the said President and Fellows of Harvard College, provided they accept the same, as aforesaid, strictly upon the trusts and purposes following, namely:—

I direct, if the said Corporation, the President, and Fellows of Harvard College accept said gift, that the sum total of all the property and moneys conveyed by my trustees to the President and Fellows of Harvard College shall be forever known and described in the records of the President and Fellows and on the books of their Treasurer as the Gordon McKay Endowment.

I give the President and Fellows full powers to hold, manage, and protect, improve, sell, invest, and reinvest at their discretion, from time to time, the property in which this Endowment may at any time be invested. I also give the said Corporation authority, in case the principal shall be at any time impaired through misfortune, to accumulate the income of the Endowment, or any part thereof, until the principal shall be made good; but, in order that the principal and income may share in the guaranty or insurance which is derived from the large mass and wide distribution of the University's investments, I prefer that the investments of the Endowment be merged, as soon and as far as in the discretion of the President and Fellows they prudently and equitably may be, with the general investments of the other permanent funds held by the President and Fellows.

The net income of said Endowment shall be used to promote applied science:—

First. By maintaining professorships, workshops, laboratories, and collections for any or all of those scientific subjects which have, or may hereafter have, applications useful to man; and

Second. By aiding meritorious and needy students in pursuing those subjects.

Inasmuch as a large part of my life has been devoted to the study and invention of machinery, I instruct the President and Fellows to take special care that the great subject of mechanical engineering in all its branches, and in the most comprehensive sense, be thoroughly provided for by my Endowment.

I direct that the President and Fellows be free to provide from the Endowment all grades of instruction in applied science, from the lowest to the highest, and that the instruction provided be kept accessible to pupils who have had no other opportunities of previous education than those which the free public schools afford.

I direct that the salaries attached to the professorships maintained from the Endowment be kept liberal, generation after generation, according to the standards of each successive generation, to the end that these professorships may always be attractive to able men, and that their effect may be to raise, in some judicious measure, the general scale of compensation for the teachers of the University.

I direct that the professors supported from this Endowment be provided with suitable assistance in their several departments by the appointment of instructors of lower grades and of draughtsmen, foremen, mechanics, clerks, or assistants, as occasion may require, my desire being that the professors be free to devote themselves to whatever part of the teaching requires the greatest skill and largest experience and to the advancement of their several subjects.

I direct that the President and Fellows be free to erect buildings for the purpose of this Endowment, and to purchase sites for the same, but only from the income of the Endowment.

I direct that all the equipment required to illustrate teaching or to give students opportunity to practise, whether instruments, diagrams, tools, machines, or apparatus, be always kept of the best design and quality, so that no antiquated, superseded, or unserviceable implement or machinery shall ever be retained in the lecture-rooms, workshops, or laboratories maintained from the Endowment.

Finally, I request that the name Gordon McKay be permanently attached to the professorships, buildings, and scholarships, or other aids for needy students which may be established, erected, or maintained from the income of this Endowment.

EXTRACTS FROM THE MINORITY REPORT IN FAVOR OF THE ALLIANCE.*

I. If the plan is not adopted, Harvard will be obliged to energetically develop the Lawrence Scientific School as a broad college of applied science. With her resources, reputation, and large body of alumni, and profiting by the lessons of experience, there is no doubt that she can make this school a success. This is abundantly proved by the experience of other universities which have technical schools. This school will be a rival of the Institute in the same community.

II. Competition in business or in education always involves some economic waste. In education it is beneficial only if necessary to keep up the spur to endeavor. The Institute does not require competition with

* This report was signed by Professors Fay, Jaggar, McKibben, Moore, Swain, Walker, and was supported by President Pritchett.

Harvard for this purpose, and without it will have ample competition with the rapidly growing schools of the Middle and Western States.

III. Of two competing schools, either one will be better than the other or they will be different. If Harvard should build up a great technical school, though ours might on the whole be the better, Harvard would undoubtedly draw to herself many strong students. Every strong student that we lose is a distinct disadvantage to us. We should keep all the strong students, if possible, and let the weak ones go to other schools.

If Harvard should make the Lawrence Scientific School a graduate school, as we understand is desired by its Dean, would not many of the strongest men who come to Boston to study engineering prefer to go where they would be associated solely with more mature men, all having completed their undergraduate courses and devoting themselves entirely to professional work, instead of coming to the Institute, where they would be associated with younger men, and with many special students, in an undergraduate school?

IV. Technical education in this country is scarcely fifty years old. It is not yet on the same plane with instruction in the so-called learned professions. The time has not yet come for making engineering schools generally graduate schools, like so many of those of law and medicine. The Institute and most other engineering schools must remain primarily, for some time at least, undergraduate schools; but the level of industrial education will in the course of time be gradually lifted. The engineer, in order to reach the highest standard, will be expected to be liberally trained and yet to be a specialist. The Institute being one of many, when the university technical schools more generally reach the standard of the Institute,—and some of them have already fully reached and perhaps in some respects exceeded it,—is there not ground for believing that the young man who desires to qualify himself most completely for the engineering profession will seek the school which has the broadest environment, where he will be brought into relations with students of other professions?

V. The Institute having shown the way, there are now many technical schools where forty years ago there were few. A great majority of these are intimately connected with universities, and the fees at many of them are very low; they are doing excellent work, some as good work as the Institute; they have a much larger body of students; and they are turning out each year a much larger body of graduates than the isolated technical schools. The influence of these university technical schools, industrially and educationally, is increasing relatively in comparison with the isolated technical schools. May not our own influence diminish in the course of time, as the body of alumni of the university technical schools increases in number and in influence? Will we not gain by placing ourselves in the main educational current in the country, by allying ourselves with our most powerful university, especially as we can do so without sacrificing our methods or our control?

VI. Competition from the West will increase. The industrial centre of the country is shifting. When the Institute was established, it was in New England; and even the iron industry and the mining industry were important here. As the years go by, new technical schools will be established in the West, at places like Chicago and Pittsburg, either independent or connected with universities. These schools may well be in closer touch with the indus-

tries of the country than any school in New England would be. When they shall have had time to grow to their full development, what will be the effect upon the Institute of Technology, especially if it is isolated, out of the main current of educational development, and actively competing for support and students with another strong school not three miles distant?

VII. If this agreement is rejected by the Institute Corporation and Harvard energetically develops her technical school, Harvard alumni all over the country—lawyers, bankers, merchants, engineers, men in responsible positions in the great industries—will be enlisted in an active campaign to promote Harvard interests as against Institute interests. By acting together and giving the preference to Harvard graduates, they may at least seriously hamper the growth and retard the development of the Institute. By allying ourselves with Harvard, we should gain the active support of this large and influential body of men instead of their opposition.

VIII. By combination and cooperation instead of competition there is economy in administration; in heads of departments; in libraries and photographs; in museums and collections; in lecture apparatus and similar appliances; in buildings, especially as regards large lecture-rooms not often used; and, to a greater or less extent, in laboratory apparatus.

IX. There is also an economy or an increase of efficiency in combination, with reference to the instructing force. With the same number of men that would be required for two separate institutions a single institution would allow greater specialization in the teaching, permitting the student to come in contact with a larger number of inspiring teachers, or it would enable more than one teacher to teach the same subject, thus stimulating each to do his best. This stimulus would be greater if the two teachers were in one institution than if they were in two. There might, and probably would, also be an economy in the number of teachers, especially in the purely lecture courses, and, as already stated, in heads of departments.

X. If Harvard energetically develops her technical school, she will probably, in course of time, have more resources available than the Institute, considering her large number of wealthy alumni and their relations to the business world. The McKay will provides "that the salaries attached to the professorships maintained from the endowment be kept liberal, generation after generation, according to the standard of each successive generation, to the end that these professorships may always be attractive to able men, and that their effect may be to raise in some judicious measure the general scale of compensation for teachers of the university." In the course of time, therefore, when the McKay money becomes entirely available, it seems inevitable that Harvard will have a very high standard of salaries for professors in her technical school,—probably much higher than those at the Institute. In this case she could attract to these positions the ablest men, who can not now afford to be teachers because of the inadequate reward. Whether under these conditions the Institute would be the leader in technical education in this community is at least doubtful.

XI. Increase in the number of students, if accompanied by corresponding adaptation or organization of the teaching force, should also conduce to economy and efficiency.

XII. Whether the plan is adopted or not, we can limit our numbers by raising the standard. If increase of numbers is a disadvantage, we should limit them in this

way rather than in any arbitrary way. By adopting the proposed plan, we retain the field, and can get all the strongest students from this community. If there are two schools, Harvard will very likely get as many as we do.

XIII. The addition of the Harvard Faculty to that of the Institute would be a distinct gain. Whether all would harmoniously work together at once is of little consequence. Temporary adjustments might have to be made. With broad-minded cooperation a larger efficiency would result by adding to our body a staff of able teachers with new ideas and without Institute traditions, but animated by ideals and purposes as high as our own. Of all men the teacher is most likely to get into a rut. In-breeding emphasizes this tendency. The influx of a body of new men with other points of view than our own would tend to counteract it.

XIV. If the proposed plan should result in more intimate association between our Faculty and the Faculty of Harvard College, the result would be beneficial.

XV. Institute students are given a narrow training, and would benefit by association with men studying the humanities and the other professions.

XVI. One great lack which Institute men have always felt is college life and college spirit. Many of them come from their homes or boarding places in the morning, attend their classes, and go home at night, seeing little of their fellows, and gaining no experience in the art of getting on with men. Their after-success will probably depend as much upon their ability to deal with men as upon a knowledge of their profession, and their progress may be much retarded by a lack of some qualities which they might gain at the Institute if they could take the time for more intimate association with their classmates. Moving to a site out of town would give the opportunity for a change in this respect, since it would render possible the introduction of dormitory life.

XVII. The surroundings of many of our Institute students in cheap boarding houses, with poor food and the temptations of a great city about them, are in many cases most unfavorable. We believe the distractions and diversions of such a life, and even the distractions in home life from the presence of friends and relatives and from home chores and duties, are much greater on the average than those which would arise under proper management in the dormitory system. The proposed plan would be an improvement over present conditions, because a larger proportion of students would live in the suburbs, and because dormitories might be established, which is now impracticable.

XVIII. Educational institutions must depend more and more upon gifts from wealthy men. Harvard University and the Institute are in the same community. They must appeal for support to the same class of persons, and in many cases to the same individuals. If the two were working together, the finanical results would be better than if the two were working separately and in opposition to each other.

XIX. Rich men who have large sums of money to give away desire to have their gifts expended economically, and, as a rule, they believe that economy results from combination and cooperation rather than from competition. If this agreement should be declined by the Institute, many of them would say that the Institute was unwilling to cooperate, and thereby increase efficiency and economy, while Harvard University was willing to cooperate. This attitude would render them less likely to give to the Institute.

The present plan seems to offer almost

the ideal form of affiliation. The Institute students, together with those now registered in the Lawrence Scientific School, number about 2,100; the Harvard College undergraduates number about 2,000. The technical school, therefore, would be the largest part of the combination, and would be subject to its own Faculty. It would seem most improbable that under these circumstances the smaller body, the great majority of whom are also earnest men, could unfavorably affect the larger and more compact professional body.

XXI. The reciprocal privileges which the plan proposes would very likely be of great value to both institutions, particularly in the case of advanced students.

XXII. By the plan proposed we can get all the benefits of combination and cooperation without relinquishing the power to do anything we are able to do under present conditions.

XXIII. The plan proposed would be of advantage to Harvard for many of the reasons which have already been adduced.

XXIV. The plan proposed would be of benefit to the community by giving it on the whole better advantages for technical education than could be obtained in any other way, and by enabling it to enthusiastically support, financially and morally, a single great institution with which the name of Boston and Massachusetts would be everywhere associated.

Conclusion.

Weighing the arguments in favor of the plan and those against it, we believe that those in favor decidedly outweigh those against, and that the possibilities are offered us of building up a better and a greater Institute of Technology than has hitherto existed. We believe, moreover, that the plan would be an educational benefit not only to the Institute, but to Harvard University and to the community. Boston would have one great technical school uniting the forces of two great institutions, and with a united community supporting it. It may be anticipated that it would not be allowed to suffer financially. The Institute would be free, under the plan, to develop in any way which might seem best, and it could do anything under the plan it can do at present, with the added advantage of Harvard's support. We could draw to us the strongest students not only from this community, but from other parts of the country, without suffering any of the disadvantages which would arise, as we believe, from the active competition of a neighboring and powerful school. The best way, and indeed the only way to accomplish in full measure the greatest future for the Institute, would seem to us to lie in securing control of the field of technical education in this community.

EXTRACTS FROM THE REPORT ADVERSE TO THE ALLIANCE ADOPTED BY THE FACULTY.

In the list of advantages to the Institute connected with the proposed agreement, removal to the Brighton location has been included by few. President Pritchett does not view it with complete favor, and opinions differ merely as to the degree of disadvantage. Apart from the financial question and the mandatory character of the agreement in this respect, the proposed site has disadvantages connected with the housing and life of the students and the problem of transportation.

At present 44 per cent. of our students live at their own homes, with advantage to themselves and to the Institute. Undoubtedly this has an important conservative effect in determining the atmosphere of the Institute. Removal to a more distant site would greatly decrease this number, and increase the total cost of living

to the student body. It would also introduce the problem of establishing a dormitory system—a problem altogether too important to be settled thus incidentally. A carefully devised dormitory system, it is true, might not seriously menace the professional spirit of our students; but the establishment of such a dormitory system in proximity to Harvard College would involve exceptional difficulties. Upon the question of transportation it may be said that the means now existing and projected, together with the increased facilities that a demand would stimulate, make the location as accessible as might be expected of any place at a similar distance from the center of Boston.

On the other hand, our present site has contributed in no small degree to the distinct individuality of the Institute. This site, in a busy city, is by many regarded as one of our most valuable educational assets, and has great strategic advantages. Students can live in any of the surrounding suburbs, and can in general reach the Institute by one line of steam or electric cars without change, and are within walking distance of the railroad stations; and in like manner they can go from the Institute to engineering and industrial works in a wide circle of suburbs and neighboring towns. The central location attracts to our halls educational and engineering bodies that help to make a professional atmosphere, and assist in advertising the Institute to a scientific constituency of the utmost importance.

Lack of Definition of the Term 'Industrial Science,' as Bearing upon Instruction and upon Degrees.

In connection with the proposed alliance, much has been said of the avoidance of educational duplication; but the terms of the agreement as they stand fail to make it clear that any definite partition has been formulated, either in scientific instruction or in the granting of degrees in science. Nowhere is there a definition of the term 'industrial science,' upon the exact meaning of which these matters depend. The interpretations of the term which have been given to us, in so far as they make matters clear, imply that the intention is to consent to continued duplication in large elementary courses and in some advanced classes, rather than to attempt the unsound and impossible separation between pure and applied science. It has been explained to us that the intention is to continue in the Institute both instruction and the granting of degrees in such branches of pure science as chemistry, physics, geology, and biology. There is reason to believe that the University contemplates the retention of instruction and degree-giving in all these subjects, as well as the retention of elementary instruction in at least some branches of industrial science as College electives. The University also reserves its right to grant any and all degrees, in applied science as well as in pure science; but the agreement implies that Harvard degrees in applied science would hereafter be granted only upon the recommendation of the Faculty of the Institute. The Institute, on the other hand, seems to agree by implication to discontinue the granting of the Ph.D. degree, and of all degrees in other than 'industrial science,' which, as interpreted to us, is to include those branches of pure science, already mentioned, in which degrees are at present granted by the Institute. If, as would appear, the wording of Section XII. constitutes an abdication on the part of the Institute of the right to grant any degrees other than those specified, why should such an abdication be permissible on the part of the Institute when, as we are informed,

the lawyers doubted whether the University could legally divest itself of a similar right?

Probability that the Earlier Years of Institute Work would be Absorbed by Harvard College.

Disaster to the integrity of the Institute's curriculum will, it seems to us, be the logical result of this lack of definition of the term 'industrial science,' when it is taken in connection with the fact that the College gives, and is likely to continue giving, elementary courses in mathematics, and in chemical, physical, and engineering subjects. It will be much more natural for a student intending to get an engineering degree to take his elementary work in the College. That such a result is anticipated by the framers of the agreement would appear from the statement of President Pritchett that the stronger technical schools are to take a forward step by which they will be free from much elementary work.

Two special causes are likely to contribute largely to this result. The first is that the tuition fee at Harvard is $100 less than that of the Institute. Even if the fees were to be equalized, at a serious financial loss to the Institute, there yet remains the second fact that participation in University athletics is open only to students enrolled at Harvard. Boys who are intending ultimately to become engineers, but who are also ambitious of athletic distinction, or even those who desire the real use rather than the partial privilege of the Harvard playgrounds, would be likely to take their elementary work in the College rather than in the Institute. Under existing conditions many parents prefer the professional atmosphere to the academic, and send their sons to the Institute rather for that reason than because they have any particular engineering career definitely planned for them. It can hardly be expected that this patronage would continue under the altered conditions now proposed.

Yet the most serious effect upon our curriculum, in consequence of such a change of methods, would be the loss of that absolute control over our instruction which we consider essential to the maintenance of our standards. If we turn over our elementary scientific work to another faculty, whose educational purposes and methods are essentially different from ours, we make impossible that close coordination of studies which we consider a prerequisite of successful technological education. Courses of elementary instruction, actually conducted by the Institute, not only give us a rule of comparison between the scientific preparation that is offered by students coming from other institutions and that which we desire and can insist upon, but they insure an advantageous uniformity of training to the great bulk of our students in those scientific studies which are the fundamentals of all technological education. We do not view any prospect of their abandonment with favor.

Sacrifice of Control.

A further disadvantage of the proposed agreement is the modification that it makes in the present method of government of the Institute. A new Executive Committee is created, of which at least three members out of nine shall be members of the Corporation of the University. It is our opinion that under this arrangement the 'organization, control, and traditions' of the Massachusetts Institute of Technology would not be so safeguarded as to inspire that confidence in the preservation of its individuality and in the continuance of its educational autonomy which we re-

gard as absolutely essential to the well-being of the Institute and to the efficiency of its work. * * *

The Department of Architecture.

A thoroughly objectionable section of the agreement is that which excludes the Department of Architecture from its provisions, leaving the future of one of the original and one of the most brilliantly successful departments of the Institute wholly unsettled and problematical. * * *

Loss of Alumni Interest and Support.

Another disadvantage of the alliance is the danger that the interest and support of the graduates of the Institute will be sacrificed. An important element in the organic growth of an educational institution is a strong, well-organized association of its alumni, the men who can best appreciate the advantages and needs of the institution and who know the places where it can be strengthened. The Institute has such an Alumni Association, with local branches in all parts of the United States, and with a compact subsidiary organization in the form of an Association of Class Secretaries which has proved itself to be useful and efficient, and which promises to grow in importance. The alumni have shown a deep and enthusiastic loyalty, which has taken a practical form in subscription for the William Barton Rogers Scholarship Fund, the Walker Memorial Building, and, more recently and generously, for the Technology Fund. If the proposed alliance is accomplished, the interest of the alumni is sure to diminish with their diminished responsibility for the maintenance of the Institute, and may be altogether alienated. The loyalty of future graduates would at best be a divided sentiment.

Conclusion.

An institution which has passed beyond its formative period has a right, as a man has, to its own character and individuality. It has earned the right to grow and change along its own lines, and not to be violently wrenched out of them and made over, under new and untried influences, into something different from itself. Such a course might be justifiable as a desperate expedient in the case of a demoralized and decaying school. But the Institute is in no sense a decaying institution. While making no claim to perfection, it desires nothing so earnestly as a fuller and richer though not necessarily a larger growth.

In point of numbers, however, the Institute, despite a steady increase in its requirements for admission and an exceptionally high tuition fee, is more than holding its own, not only in Massachusetts, but throughout New England, and not only in New England but throughout the United States. Our defects—and no one is more conscious of them or more desirous to amend them than is the Faculty—are in part consequences of growth and of success. In part, however, they are inevitable defects of the qualities which have made us what we are. The lack of academic leisure and of monumental college surroundings, and the absence of a great part of the social and athletic life of the typical American college,—such losses are a necessary price which we and our students pay for the spirit of professional study, of business-like regularity, and of scientific accuracy. In the training of engineers we believe that these qualities are worth vastly more than the desirable things which we sacrifice in order to obtain them. While continuing to insist upon these qualities, we shall be glad, so far as we can safely do so, to diminish their defects. But we believe that we can best accomplish this by

remaining free to deal with the problem by methods under our own control. With that high regard for the spirit of university life to be expected from a body of men more than half of whom, as is the case with this Faculty, have received their training from colleges and universities, rather than exclusively from technological schools, we are nevertheless firmly convinced that the effect of direct contact and intermingling of our student body with the dormitory, social, and athletic life of college undergraduates, under the conditions obtaining in this case, would be more harmful than beneficial, and that it would be little less than totally destructive of the established character and atmosphere of the Institute.

A successful and valuable school quite different from ours might no doubt be developed under university conditions, but that would much better be done independently, from such beginnings as already exist, rather than upon the basis of our reputation and at the cost of our individuality. With institutions, as with men, character is a thing which may be undermined and destroyed, but which can not be bought or sold or transferred. The success of the Institute thus far has surely not been due to its wealth, to its superior equipment, or to large salaries paid to its instructing staff. Its success has been and still is a success mainly of character and morale; and it is precisely these vital qualities which the Faculty believes would be destroyed by the changes called for under the terms of this proposed agreement. For it is not merely proposed to remove the Institute to a new site, but to graft it upon another institution.

Very grave questions of policy would at once confront the new Executive Committee in the problems arising from removal and from the establishment of an entirely new type of life among our students, and from the adjustment of working relations with the University. The controversies and differences within the Committee to which these questions would give rise, and ought to give rise, might under this agreement lead at any time to one of two things:— the rupture of the agreement, or the transfer to the University of a complete control over the working Institute by the election of a majority instead of a minority of the joint Executive Committee from the membership of the University Corporation. The adoption of this agreement would therefore plunge the Institute at once into a condition of uncertainty concerning the preservation of its individuality and control,—an uncertainty probably more prejudicial to its organic development than an immediate and entire surrender of control would be. Even the full assent of the Institute to the proposed agreement would not make it certain that the project is to be carried out. It would have still to receive the sanction of the University, the ratification of the Overseers, and to await indefinitely various legal proceedings and decisions. All these contemplated delays and uncertainties would be further augmented by such other contingencies and delays as must necessarily arise in carrying out so vast and complex an undertaking. This period of uncertainty, extending inevitably over five or six years, would be most prejudicial to the educational work and to the educational prestige of the Institute.

In closing, the Faculty is glad, in accordance with a request made by the President, to take this opportunity to state that it fully believes in the possibility of cooperation in effort between Harvard University and the Institute, and trusts that this may be secured in the future to as great an extent as practicable. There are necessarily limitations to such cooperation,

but we are convinced that it is possible, by consultation and conference, to secure a cooperation thus limited which will prove beneficial to industrial education in general, as well as to the particular work of both institutions. By the more frequent interchange of instructors, by allowing to the advanced students of each institution such privileges of instruction in the other as may be practicable, by the common use of valuable apparatus, by the participation in University and Institute seminars of instructors and students of both institutions, by giving advanced courses of lectures to the combined classes of both institutions; perhaps by mutual agreement from time to time tc relegate certain branches of instruction to one of the two; by carrying out together advanced engineering researches and tests,—by these, and by various other ways that will suggest themselves, much may be accomplished in harmonious effort which should be highly beneficial to both the University and the Institute. This development, however, must be a growth. It can not be forced, as the proposed agreement would attempt to force it, for it is in the nature of continuous experiment, presenting problems for the solution of which nc data exist.

SCIENTIFIC BOOKS.

Madreporaria, Parts III. and IV. By J. Stanley Gardiner, M.A., etc. (From 'The Fauna and Geography of the Maldive and Laccadive Archipelagoes,' Vol. II., Supplement I., pp. 933–957, pls. LXXXIX–XCIII.)

The first installment of Mr. Gardiner's report on the Madreporaria from the Maldive and Laccadive Archipelagoes has already been reviewed in the columns of this journal.* The second installment, which has just been received, contains an account of the Fungida and Turbinolidæ.

* Vol. XX., No. 511, pp. 503–505, October 14, 1904.

III. Fungida.—548 specimens, besides a number of young forms and fragments, were obtained. These are divided into 27 species and 2 varieties, representing 15 genera; against 24 species and 9 genera reported by Klunzinger from the Red Sea, and 15 species and 7 genera found by the author in the Pacific.

The following is a list of the genera with the number of species referred to each, and the names of the forms considered new: *Psammoseris*, 1; *Siderastrea*, 4, *S. maldivensis*, nov.; *Agaricia*, 1, *A. ponderosa*, nov., + var. *minikoiensis*, nov.; *Fungia*, 3; *Podobacia*, 1; *Halomitra*, 1; *Herpetolitha*, 1, *H. simplex*, nov.; *Cycloseris*, 2; *Diaseris*, 1; *Pavonia*, 1; *Leptoseris*, 3, *L. incrustans*, nov.; *Echinophyllia*, 1; *Pachyseris*, 1; *Coscinaræa*, 2, *C. donnani*, nov.; *Psammocora*, 4; *P. divaricata*, nov.

Mr. Gardiner does not follow von Marenzeller in referring *Stephanoseris* to the synonymy of *Heterocyathus* and *Psammoseris* to that of *Heteropsammia*, but combines *Stephanoseris* and *Psammoseris* under the latter name. He goes further and puts the type species of *Psammoseris* (*P. hemispherica*) in the synonymy of the type species of *Stephanoseris*, which was originally described as *Heterocyathus roussæanus*.

I somewhat doubt the correctness of the generic determination of *Siderastrea clava*, *S. lilacea* and *S. maldivensis*. Mr. Gardiner calls attention to these 'having in their surface parts the thecæ of neighboring calices quite separate from one another, joined together only by costæ, instead of fused together into a single dividing wall.' This difference did not escape his attention.

Mr. Gardiner himself doubts his *Agaricia ponderosa* really being an *Agaricia*. I feel rather confident that it is not an *Agaricia*. The type species of the genus is *A. undata* (Ell. & Sol.) Lamk; the type specimen is in the Hunterian Museum, Glasgow, where I have seen it and Professor J. Graham Kerr has kindly sent me photographs. The genus can be briefly characterized as follows: *Corallum* compound, thin, foliaceous. *Common wall* imperforate, naked, finely striate; no differen-

tiated corallite walls. *Calices* forming more or less definitely concentric series, which are bounded below by a subcalicular swelling or ridge; there is no swelling or ridge above, the septo-costæ running directly to the next series. Septa well developed, distinctly radiate, imperforate. *Columella* a single tubercle. *Agaricia fragilis* (Dana) agrees in generic characters with the type and is a closely related species.

I think that Mr. Gardiner's criticism of Professor Döderlein's monograph, 'Die Korallengattung Fungia,' is in some respects too severe. He says: "It is quite clear that that author [Döderlein] has, generally speaking, no scientific basis for his description of 'varieties.'" The word variety is difficult to define in a manner that will be satisfactory to all systematists, and Mr. Gardiner himself is guilty of an inconsistency. Under *Fungia dentigera,* he speaks of 'a true variety, the separating characters of which are discontinuous.' If the characters are discontinuous, the specimens belong to a distinct species. Mr. Gardiner in Part I. of his 'Madreporaria of the Maldives and Laccadives' says 'discontinuous or specific' variation. Variation in corals is so complex and its causes are so little understood that one should be very lenient in criticizing the efforts of a fellow worker to handle its phenomena. There are mistakes in Döderlein's work; some of his varieties can not be maintained by any of the usually accepted canons of zoological nomenclature, but his work is earnest and he has much advanced our knowledge of the genus *Fungia.*

I am glad to see that Mr. Gardiner considers *Podobacia* a valid genus, and heartily agree with him in that course.

As regards *Cycloseris* and *Fungia,* I agree with Döderlein. The only possible basis for their separation into two genera would be in *Cycloseris* having originally only six primary septa and *Fungia* twelve. The validity of this character is extremely doubtful, as it rests on a very slim foundation.

Without entering into a discussion of my reasons, I will state that I believe Quelch was correct in uniting *Cycloseris* and *Diaseris,* and, as stated in what precedes, I agree with Döderlein in combining both with *Fungia.*

IV. Turbinolidæ.—The number of specimens collected is not given. Six species, representing 4 genera, are referred to the Turbinolidæ. They are *Flabellum,* 2, *F. multifore,* nov.; *Tropidocyathus,* 1, *T. cooperi,* nov.; *Heterocyathus,* 1; *Paracyathus,* 2.

Mr. Gardiner's paper is an important contribution to the literature of reef corals. He gives valuable notes on variation, careful descriptions and figures all the forms described as new and several of those referred to previously described species.

The studies being made on the coral faunas of the Pacific and Indian oceans are bringing out many interesting facts of their geographical distribution. I have just completed a study of the Hawaiian Fungida, and may be pardoned for comparing them with those from the Indian Ocean. The following is a list of the species, with notes on their occurrence elsewhere: *Fungia* (*Cycloseris*) *patella* (Ell. & Sol.), east coast of Africa, etc.; *Fungia* (*Diaseris*) *fragilis* (Alcock), Indian Ocean; *Fungia scutaria* var. *dentigera* Leuckart, Indian Ocean, etc.; [*Fungia oahensis* Döderlein; *Fungia paumotensis* Stutchb. (*fide* Quelch), Philippines, etc.; *Fungia echinata* (Pallas) (*fide* Studer)]* Indian Ocean, etc.; *Bathyactis stephana* Alcock, Indian Ocean; *Stephanaria stellata* Verrill, Panama; *Stephanaria* n. sp.; *Pavona varians* Verrill, aff. *P. repens* Brüggemann; *Pavona* n. sp.; *Leptoseris* (1) n. sp., aff. *L. fragilis* M. Ed. & H.; *Leptoseris* (2) n. sp.; *Leptoseris* (3) n. sp., aff. *L. papyracea* (Dana); *Leptoseris* (4) n. sp.; *Psammocora,* aff. *P. superficialis* Gardiner.

A fair proportion of the species actually occur in the Indian Ocean, some as far west as Africa, or have there analogues so similar that specific separation is doubtful. As would be expected, the Panamic fauna is represented to some extent.

T. WAYLAND VAUGHAN.

May 15, 1905.

* I have not seen specimens of these from the Hawaiian Islands, but the type of the first is from there.

SOCIETIES AND ACADEMIES.

THE SOCIETY FOR EXPERIMENTAL BIOLOGY AND MEDICINE.

THE twelfth meeting of the Society for Experimental Biology and Medicine was held in the laboratory of clinical pathology of the Cornell University Medical College, on Wednesday evening, May 24. The Vice-President, Edward K. Dunham, was in the chair.

Members present.—Atkinson, Auer, Brooks, Burton-Opitz, Crampton, Davenport,* Dunham, Emerson, Ewing, Field, Flexner, Gies, Herter, Levene, Levin, Lusk, Meltzer, Mendel,* Morgan, Noguchi, Norris, Oertel, Opie, Richards, Salant, Sweet, Torrey, Wallace, Wolf.

Members elected.—Joseph Erlanger, E. O. Jordan, Otto Folin.

ABSTRACTS OF REPORTS OF ORIGINAL INVESTIGATIONS.†

Contributions to the Study of Sulfur. I. The Metabolism in Brombenzol Poisoning: W. MACKIM MARRIOTT and C. G. L. WOLF.

Administration of brombenzol to dogs resulted in increased elimination of nitrogen and urea. Urea closely followed total nitrogen. Preformed ammonia was decreased. Creatinin elimination was not appreciably affected. Total sulfur excretion was not increased, but there was almost complete suppression of alkali sulfates. Excretion of neutral sulfur, represented for the most part in this case by parabromphenyl-mercapturic acid, was increased 400 per cent. Ethereal sulfate elimination was markedly increased. Total sulfate-sulfur was diminished. Excretion of chlorin and phosphorus was practically unaffected. Nitrogen and fat were increased in the feces. The drug caused ulceration of the stomach and intestines, and degeneration of the liver and kidneys.

* Non-resident member.

† The abstracts presented in this account of the proceedings have been greatly condensed from abstracts given to the secretary by the authors themselves. The latter abstracts of the reports may be found in current numbers of *American Medicine* and *Medical News*.

On Experimentally Produced Variations in the Energy of Tumor Growth: LEO LOEB. (Presented by James Ewing.)

The author's observations point to the general conclusion that it is possible to cause an experimental increase or decrease in the energy of tumor growth. Such variations may be brought about by direct stimulating or depressing influences on the tumor cells. The stimulation effects may become cumulative.

Demonstration: Photographs and Plumage-charts of Hybrid Poultry, with Remarks: CHARLES B. DAVENPORT.

Dr. Davenport exhibited photographs and plumage-charts of four hybrids between different races of poultry, and also of their parents, and remarked on the nature of the inheritance illustrated by each example.

Experimental Cirrhosis of the Liver: RICHARD M. PEARCE. (Presented by Eugene L. Opie.)

Necrotic lesions were produced in the liver of the dog by injections of hemolytic immune sera of high hemagglutinative power. The author's observations have demonstrated that cirrhosis may follow extensive primary destructive lesions produced in this way (a view not yet fully accepted) and thus support the contention of Kretz that cirrhosis is essentially the result of a series of repair processes following repeated injuries of liver parenchyma.

Experimental Arteriosclerosis: RICHARD M. PEARCE and E. MCD. STANTON. (Presented by J. E. Sweet.)

Intravenous injections of adrenalin produce in rabbits vascular lesions that are limited to the aorta and that exhibit more or less definite sequence. Five to six injections of 3 to 25 minims of 1–1,000 solutions every 24–48 hours for long periods cause at first histologically important changes in the media. After about 12–15 injections very definite lesions are evident macroscopically. In the experiments continued for 6–8 weeks, the process becomes very diffuse and small dilations of the thinner portions of the aorta assume the appearance of aneurisms. At this stage the destruction of the elastic fibers is

extreme and all degenerated areas are infiltrated with calcium salts.

Whether the vascular changes are due to a primary toxic action of the adrenalin or whether they are the result of the increased arterial tension which it causes, has not been determined.

On the Chemical and Physiological Properties of Ricin, with Demonstrations: THOMAS B. OSBORNE and LAFAYETTE B. MENDEL.

The most active preparation proved fatal when administered subcutaneously to rabbits in the small dose of 0.0005 *milligram* per kilo of body weight. The toxic constituent of the castor bean appears to be an *albumin*. Ricin is like other albumins in composition, heat coagulation, color reactions, precipitation reactions, specific rotation, state of combination of its nitrogen, etc. By tryptic digestion the agglutinating power of pure ricin may be greatly impaired or destroyed. The experience of the authors lends no encouragement to attempts to 'purify' such toxins by methods designed to eliminate proteid substances from the active materials.

On a Method of Determining Indol, with Demonstrations: C. A. HERTER and M. LOUISE FOSTER.

The authors described a rapid and accurate means of determining indol. It is based on the fact that indol, in slightly alkaline solution, readily condenses with naphthoquinon sodium mono-sulfonate and forms a *blue* crystalline compound that is only very slightly soluble in water but is readily extracted by chloroform from a watery solution or suspension. The condensation product is di-indyl naphtho-ketone mono-sulfonate. Its solution in choloroform is *red*. The method is well adapted for colorimetric or gravimetric determinations.

Anesthesia Produced by Magnesium Salts, with Demonstrations. A Preliminary Communication: S. J. MELTZER and JOHN AUER.

The authors exhibited two guinea pigs which were deeply narcotized by subcutaneous injections of magnesium sulfate. One of these animals had been similarly narcotized twice before and fully recovered each time. If the dose of magnesium salt is not too large, heart beat, blood pressure and respiration remain nearly normal during periods of narcosis in which any operation can be performed without resistance. Certain maximum doses can not be exceeded without causing extremely toxic effects.

Enzymes and Anti-enzymes of Inflammatory Exudates: EUGENE L. OPIE.

Inflammatory exudates removed from the pleural cavities of dogs one or two days after injection of the irritant (aleuronat) undergo very little change, while those removed three or more days after the onset of inflammation exhibit appreciable though slight autolysis. There is no relation between the amount of digestion and the number of cells which are present. The serum inhibits autolysis in a suspension of the cells separated by centrifugalization. The antilytic action of the serum is favored by an alkaline reaction, but is completely prevented in an acid medium. The serum of the exudate contains a proteolytic ferment which is active only in an acid medium. In the later stages of such inflammations there is some diminution of the antilytic power of the exudate.

Shallow Well Waters of Brooklyn: JAMES P. ATKINSON.

The author's observations justify the conclusions that the sandy soil of Brooklyn can not be relied upon as a safe filter for the well waters of that borough, that Brooklyn soil in populous districts seems to be nearing the saturation point for sewage, and that many of the shallow wells in Brooklyn are, therefore, in growing danger of serious pollution.

The Influence of the External Temperature upon the Viscosity of the Blood: RUSSELL BURTON-OPITZ.

The author has found that the viscosity of the 'living' blood can be greatly influenced by changing the external temperature. Viscosity was markedly increased in dogs immersed in water at 25° C. Warm water baths (42°–45° C.) produced a corresponding decrease in the viscosity. Specific gravity of the blood showed corresponding variations.

The Changes in the Viscosity of the Blood during Narcosis: Russell Burton-Opitz.

It was found that the viscosity of the blood is increased by *deep* ether or chloroform narcosis and lessened during light anesthesia. Specific gravity of the blood was increased by deep and lessened by light ether narcosis. Chloroform, on the other hand, produces a slight decrease during deep and an increase during light narcosis. Hence the specific gravity can not be regarded as a perfectly accurate index of the viscosity.

Studies of the Effects of Radium on Plants and Animals, with Demonstrations: Communicated by William J. Gies.

I. Preliminary notes on the effects of radium rays on plants. C. Stuart Gager. Plants are stimulated. For this stimulus there are minimum, optimum and maximum points, depending upon the proximity of the radium to the plant, the strength, quantity and condition of the radium salt, the time of exposure and the nature and condition of the tissue.

II. The action of radium rays on *Amœba proteus* and upon other microorganisms. Louis Hussakof. No visible effects were produced, by even the strongest radium preparations, during periods of observation of about an hour. The water surrounding the animal in each experiment may have prevented radiant effects.

III. The effects of intravenous injections of radium bromid. Russell Burton-Opitz and G. M. Meyer. Increased blood pressure, caused by general vasoconstriction, always promptly followed injection of radium preparations in small dogs. This effect was soon followed by a fall of pressure, due to decrease in frequency and accompanied by irregularity of the heart. The variations in blood pressure were extreme. These effects occur after division of both vagi. Respiration gradually decreases in frequency until respiratory paralysis results. A striking *qualitative* similarity was found to exist between the effects of pure barium bromid and radium bromid preparations of low activity (240 and 1,000). Radium bromid of 10,000 activity, however, differed from barium bromid in failing to cause irregularity in the action of the heart. Quantitative differences were also noted.

IV. The radioactivity of the different organs after intravenous injections of radium bromid. Gustave M. Meyer. Thus far determinations have been made only on the dogs used in the experiments of Burton-Opitz and Meyer (III). Practically all parts except the brain were found to be radioactive. The blood always manifested the greatest radioactivity.

V. The influence of radium bromid on metabolism in dogs. William N. Berg and William H. Welker. Feeding experiments have thus far failed to show appreciable results, except an increase in elimination of total sulfate in the urine.

William J. Gies,
Secretary.

The New York Academy of Sciences. Section of Geology and Mineralogy.

At the meeting of April 3, 1905, Professor Stevenson presiding, the following papers were read:

The Physiography of the Adirondacks: J. F. Kemp.

The Adirondacks cover some 10,000 square miles, and except for the White Mountains of New Hampshire and the Blue Ridge of North Carolina, are the loftiest summits east of the Black Hills of South Dakota. They are metamorphosed Precambrian sediments and eruptives with a surrounding fringe of Paleozoics beginning with the Potsdam and ending with the Utica, except for the Glacial drift. The eastern portion is mountainous, the western a high plateau which slopes to Lake Ontario. Three peaks exceed 5,000 feet. The general profile of the mountains is serrate, but there is great variety of shape. There are two contrasted types of valleys. One type, doubtless an instance of greater geological antiquity, presents gentle slopes and great maturity of form. Its members run east and west, and north and south, and are occupied in some cases by the larger lakes.

The second type is more recent, and is due to faulting. The valleys have on one or both sides precipitous escarpments. The cliffs run

northeast and southwest or northwest and southeast. A third series of breaks running nearly due north is also at times in evidence. The faults are most often the result of differential movements causing even a marked sheeting of the rocks. The faults run out into the Paleozoic areas, and are shown with diagrammatic distinctness, where they have been especially described by H. P. Cushing.

The problem of the drainage is of especial interest. All the waters go ultimately either to the Hudson or the St. Lawrence. The courses of the large streams follow sometimes the older type of valleys, sometimes the later. Barriers of drift have often driven them from their old lines across low, preglacial divides into new ones. The courses of the Hudson and Onondaga are particularly striking illustrations, each exhibiting one or more marked bends to the eastward. The courses of the two were described and discussed in some detail.

The different types of lakes were also described including the river valleys ponded by barriers of drift, the fault valleys and the relations to the older type of depression.

The nature of the ice invasion and its modifying effects were passed in review, chiefly along the work of I. H. Ogilvie. With a brief statement of the Post-glacial lake-fillings, etc., which have been especially set forth by C. H. Smyth, Jr., the paper closed.

The Paleogeography of Mid-Ordovicic Time: CHARLES P. BERKEY.

Both the Cambric and Ordovicic formations contain prominent sandstone strata alternating with dolomites wherever exposed in Michigan, Wisconsin, Minnesota, Iowa, Illinois, Missouri, Arkansas and Indian Territory. The northern margin, however, is prevailingly more arenaceous than the southern, where shales replace many sand beds. At still greater distance, in Ohio, Kentucky and Tennessee, these are in turn represented by limestones largely.

The uppermost one of the series is the St. Peter. This sandstone, as well as each of the more important ones below, is believed to represent an extensive retreat and re-advance of the sea. Few marks of the erosion intervals are preserved. Only here and there has the mantle of sand permitted much attack upon the underlying dolomite, and the reworking of the sands themselves has obliterated most internal evidence of such history.

Much of the sand, furthermore, is windblown. This reworking by the sea and the wind is believed to be the chief cause of the extreme purity of the St. Peter.

The St. Peter stage of the Ordovicic, therefore, represents a retreat of the Mississippian sea from the vicinity of Lake Superior to probably as far as Ohio, southern Illinois and Arkansas, followed by a readvance to its original position. The northern part of the St. Peter contains a sedimentary break. In part it is both older and younger than the same formation in its southern extension, while, on account of the reworking accompanying the sea advance, there is greater conformity with overlying than with underlying beds.

A. W. GRABAU,
Secretary.

AT the meeting of May 1, 1905, Vice-President Hovey presiding, the following papers were read:

The Pleistocene Beds of Sankaty Head, Nantucket: J. HOWARD WILSON.

When visited by early explorers, the section at this locality was kept freshly exposed by the cutting back of the bluff by the sea, but for quite a period of years this has been prevented by the northward extension of the Siasconset apron beach, so that the face of the bluff is now covered with talus and overgrown with beach grass.

The locality was visited during the summer of 1904 and considerable work done in exposing the section and making a collection of the fossils.

This work resulted in the collection of 81 species, 21 of which had never been reported from this point, including *Pandora crassidens* Conrad not previously found in any horizon above the Miocene, and *Serripes laperonsii* Deshayes and *Macoma incongrua* Von Mar-

tens belonging to the Arctic fauna of the Pacific coast and not heretofore reported east of Point Barrow.

A number of facts differing somewhat from those reported by former observers were noticed and have resulted in a somewhat different interpretation for the phenomena presented by these deposits.

The deposits are not of glacial origin, for (1) numerous delicate and unworn shells occur; (2) bivalves such as *Solen, Venus* and *Mya* occur in the position in which they lived with both valves together, and in the case of *Venus,* with the ligament in place; (3) the faunas are not mixed as would be the case if of glacial origin, the lower beds containing shoal-water species of a southern range, and the upper, deeper water species of a northern and even Arctic type.

The lower beds were deposited in a shallow inlet or lagoon, as shown by such species as *Mya, Ostrea* and *Venus* and especially by numerous mud crabs and the presence of our edible crab, *Callinectes sapidus,* while the upper beds were deposited during a subsidence of the area contemporaneous with the advance of the Wisconsin ice sheet, as shown by the deeper water and more northern species.

After the destruction and washing into the lagoon of the protecting barrier beach, as shown by the overlying rounded and pure, white sands, the ice reached and passed this point, eventually burying the beds under fifty feet or more of drift. Later, a reelevation took place, bringing the land to about its present position.

Early Stages of some Paleozoic Corals: C. E. Gordon.

J. E. Duerdon in the Johns Hopkins University Circular for 1902 has endeavored to show by studies based on *Lophophyllum proliferum* that the Rugosa exhibit a hexameral plan of growth of the primary septa, in so far as *L. proliferum* may be taken as representative. Certain studies on *Streptelasma profundum* show a primary tetrameral plan. The fact that *S. profundum* is a middle Ordovicic type suggests that this is the primitive condition. Moreover, a careful examination of Duerdon's figures shows that they lend themselves to an entirely different interpretation from that which Duerdon gives. This interpretation is that two of the so-called primary septa are secondary septa precociously developed; that their sequence and ultimate position are the same as those for the secondary septa which appear in the corresponding positions in the corresponding quadrants of a zaphrentoid coral; that the fossula and cardinal septum are on the concave side of the corallum; and that if Duerdon's figures be inverted they reveal a perfect similarity to a zaphrentoid coral, as far as the order of appearance and the arrangement of the septa are concerned.

The fact that *L. proliferum* is of Carbonic age indicates that it is a modified type of the zaphrentoid coral, the first secondary septa appearing in nepionic stages and thus simulating the character of primary septa.

A New Lower Tertiary Fauna from Chappaquiddick Island, Martha's Vineyard: Thomas C. Brown.

A few years ago while studying the Cretacic deposits of Long Island, Block Island and Martha's Vineyard, Dr. Arthur Hollick made a collection of fossil molluscs and plants from Chappaquiddick Island. The fossil molluscs were deposited in the Columbia University collection without being fully and carefully studied.

These fossils occur in the island in ferruginous concretions. They seem to have been deposited somewhere to the north of where they are now found, then moved as glacial drift, reassorted and deposited in their present position. From their lithological similarity to concretions containing undoubted Cretacic fossils found elsewhere on Martha's Vineyard, Dr. Hollick thought that these concretions and their contained fossils must be of Cretacic age.

Professor Shaler noted the occurrence of these concretions and their similarities to the Cretacic drift, but being unable to find any distinctive organic remains hesitated to set them down as Cretacic.

Professor R. P. Whitfield considered that

these rocks could hardly be Cretacic, since the fossils were of a more recent type.

A careful study of the fossils has shown that this material is not Cretacic but Eocene in age. This fauna from Chappaquiddick represents a new and distinct Eocene province, differing from all the other Eocene provinces of the Atlantic coast, but no more widely different from these than they are from one another. Although in this fauna there are several species somewhat resembling those of the provinces to the south, on the whole it would seem to be more closely allied to the Eocene of England. The genera most abundantly represented in these Chappaquiddick deposits, *e. g., Modiola, Glycymeris,* are also among the most abundant in the English deposits. These same genera, although represented in the Atlantic and gulf provinces, are there more sparsely distributed and occur with other more abundantly represented genera that appear to be altogether wanting in the Chappaquiddick deposits.

A comparison of this Chappaquiddick fauna with other Eocene faunas indicates that it is of lower Eocene age, the species most closely resembling those found in this fauna being found in the lower beds of the Atlantic and gulf provinces, the Tejon of California and the lower beds of England. These deposits may possibly be of the same age as the Shark River beds of New Jersey, but being deposited in a region separated from this have no forms in common with it. But such correlation could be only conjecture. As the correlation of the well-known Eocene deposits is even yet very uncertain it is unnecessary and impossible to place these beds any more definitely than simply to say that they are Lower Eocene.

Structural Relations and Origin of the Limonite Beds at Cornwall, N. Y.: C. A. HARTNAGEL.

The limonite at the Townsend iron mine, near Cornwall in Orange County, N. Y., is found at the base of the New Scotland beds where the latter are in contact with the Longwood red shales. The source of the iron is evidently from the red shales but whether the contact was due to overlap or faulting has not been previously explained. Two thirds of a mile north of the mine the Decker Ferry, Cobleskill, Rondout, Manlius and Coeymans formations, having a total thickness of 95 feet, are found between the New Scotland and Longwood beds. In the region of the mine the strata are nearly vertical and in faulting a wedge-shaped block was forced up, bringing the red shales in contact with the New Scotland beds. A cap of limestone has until recent geologic times protected from erosion the mass of soft Longwood shales which now form a steep hill, but which is rapidly being worn away.

Types of Sedimentary Overlap: A. W. GRABAU.

With a normal sea shore, a rising sea level will produce the phenomenon of progressive overlap, a falling sea level that of regressive overlap. If the sea transgresses slowly, and the rate of supply of detritus is uniform a basal rudyte or arenyte is formed which rises in the column as the sea advances, and whose depositional off-shore equivalents are successive beds of lutytes or organic deposits (biogenics). Types of such basal beds which pass diagonally across the time scale, are seen in the basal Cambric arenytes of eastern North America, which as the Vermont Quartzite are lower Cambric, and as the Potsdam are Upper Cambric. Again in the Basal Cretacic arenyte of southwestern United States, this is shown, these being basal Trinity in Texas, Washita in Kansas, and Dakota or later on the Front Range. Examples of this type of progressive overlap are numerous and familiar. On an ancient peneplain surface the transgressing sea may spread a basal black shale, as in the case of the Eureka (Noel) Black shale, which is basal Choteau in southern Missouri and basal Burlington in northern Arkansas. Regressive movements of the shore succeeded by transgressive movements give us arenytes which are enclosed in offshore sediments and which within themselves comprise an hiatus the magnitude of which diminishes progressively away from the shore. An example of this has recently been discussed by Berkey * who finds that the St. Peter Sandstone in Minnesota marks the interval from

* See *ante*, April meeting.

lower Beekmantown to upper Stones River, which interval is represented by several thousand feet of calcareous sediments in other regions distant from the shore of that time.

In marine transgressive overlaps, later members overlap earlier ones toward the source of supply, *i. e.*, towards the old-land. In non-marine progressive overlaps, later members overlap the earlier ones away from the source of supply. Thus in a growing alluvial cone, the later formed beds will extend farther out on to the plain away from the mountain. If several successive fans of this type are formed one above the other, owing to successive elevations of the source of supply, only the latest beds of each delta will be found on the outer edge of this compound delta, the hiatus between the beds being further emphasized by the erosion which the last bed of the first delta underwent during the time that the early beds of the second delta were deposited nearer the source of supply, *i. e.*, before the last bed of the second delta covered up the remnant of the last bed of the first delta and thus protected it from further erosion. A good example of this type of overlap appears to be presented by the Pocono, Mauch Chunk and Pottsville beds of the Appalachian region. These formations are with exception of the negligible Greenbrier member, of non-marine origin, representing the wash from the growing Appalachians. In western Pennsylvania only the latest beds of each (barring portions removed by erosion between the deposition of the successive fans) are found resting one upon the other, the interval between the beds becoming less and less toward the anthracite regions.

A. W. Grabau,
Secretary.

SECTION OF BIOLOGY.

At the April meeting Professor H. F. Osborn presented a discussion of 'The Ideas and Terms of Modern Philosophical Anatomy,' and Dr. O. R. Hay described 'Turtles of the Bridger Basin.' The full abstract of Professor Osborn's paper was published in Science for June 23. Dr. Hay gave a brief description of the extent of the Bridger beds and of the nature of the materials composing them. He expressed the conviction that these deposits had not been made in a lake, but over the flood-grounds of rivers. The region was probably covered with forests, and teemed with animal life. In the streams were numerous turtles. Many species of these have been described by Dr. Leidy and Professor Cope. In the speaker's hands are materials for the description of about a dozen more species. The American Museum party of 1903 collected many specimens of the genus and these have furnished good skulls, neck, shoulder and pelvic girdles, and the limbs. These materials confirm the validity of Lydekker's group called Amphichelydia, and show that from it sprang the modern super-families Cryptodira and Pleurodira.

At the May meeting of the section papers were presented by Professor E. B. Wilson on 'Observations on the Chromosomes in Hemiptera,' and by Professor H. E. Crampton on 'Correlation and Selection.'

Professor Wilson's paper presented the results of an examination of the mode of distribution of the chromosomes to the spermatozoa in *Lygæus turcicus, Cœnus delius, Podisus spinosus* and two species of *Euchistus*. In none of these forms is an accessory chromosome (in the ordinary sense) present, all of the spermatozoa receiving the same number of chromosomes, which is one half the spermatogonial number (the latter number is in *Podisus* sixteen, in the other forms fourteen). In all these forms, however, an asymmetry of distribution occurs such that two classes of spermatozoa are formed in equal numbers, both receiving a ring of six chromosomes (in *Podisus* seven) that are duplicated in all the spermatozoa, and in addition a central one which in one half the spermatozoa is much smaller than in the other half. These corresponding but unequal chromosomes (which evidently correspond to some of the forms described by Montgomery as 'chromatin nucleoli,' and agree in mode of distribution with that which this author has described in the case of *Euchistus tristigmus*) may be called the 'idiochromosomes.' They always remain separate in the first division, which accord-

ingly shows one more than one half the spermatogonial number of chromosomes, but at the close of this division conjugate to form an asymmetrical dyad, the number of separate chromatin-elements being thus reduced from eight to seven (in *Podisus* from nine to eight). A reduction of the number to seven in the first division, such as has been described by Montgomery as an occasional or usual process in *Euchistus* and *Cœnus,* was never observed. In the second division the asymmetrical idiochromosome-dyad separates into its unequal constituents, while the other dyads divide symmetrically. One half the spermatozoa, therefore, receive the large idiochromosome and one half the small, the other chromosomes being exactly duplicated in both.

Correlated with this asymmetry of distribution is the fact that the spermatogonial chromosome-groups do not show two equal microchromosomes (as is the case in such forms as *Anasa, Alydus* or *Protenor,* where an accessory chromosome is present) but only one, which is obviously the small idiochromosome, the large one not being certainly distinguishable at this period from the other spermatogonial chromosomes. The final synapsis of the idiochromosomes is deferred to the prophases of the second division, somewhat as that of the two equal microchromosomes is deferred until the prophase of the first division in *Anasa, Alydus* and some other forms. A remarkable result of the difference in this regard between the forms that possess and those that lack a true accessory chromosome is that in the former case (*Anasa, Alydus,* etc.) the first division of the small central chromosome is a reduction-division and the second an equation-division; while in the latter case (*Lygæus, Cœnus,* etc.) the reverse order manifestly occurs. The relation of these observations to earlier ones by Paulmier, Montgomery and others was pointed out, with a discussion of their bearing on the Mendelian phenomena of heredity and the problem of sex-determination.

Professor Crampton presented briefly some of the conclusions drawn from the results of his work upon variation, correlation and selection among saturnid lepidoptera. The earliest studies showed that eliminated individuals, when compared with similar members of the same group that survive, prove to be more variable and of somewhat different types, although this relation between variability and selection is not a constant one. The characters utilized for these preliminary studies, namely, certain pupal dimensions and proportions were of such a nature that they could not serve the pupa directly in any functional manner, wherefore it was concluded that their condition of correlation formed the actual basis for the selective process, formative correlation being also distinguished from functional correlation. That the general condition of correlation among the structural characters of pupæ formed, indeed, the basis for selection was further indicated by the results of a statistical study of the correlations between various characteristics of pupal groups from several different animal series; although an advantage did not always appear in favor of the surviving group. On the basis of the foregoing, a general theoretical conception was developed, according to which the whole series of internal elements and the whole series of external influences were regarded as involved in the determination of the general condition of correlation or coordination that formed the basis for selection, as adaptive or the reverse.

M. A. BIGELOW,
Secretary.

DISCUSSION AND CORRESPONDENCE.

PRE-PLEISTOCENE DEPOSITS AT THIRD CLIFF, MASSACHUSETTS.

TO THE EDITOR OF SCIENCE: It has been suggested by several writers (Shaler and Verrill) that Tertiary and Cretaceous deposits may occur on the floor of the sea north of their known occurrence on Marthas Vineyard and Cape Cod. Their northerly occurrence on land has not been noted except for the Miocene greensands at Marshfield, Mass. (Duxbury sheet, U. S. G. S.). During the spring field season at Harvard University the writer reexamined the coast from Boston Harbor to Peaked Cliff, fifteen miles southeast of Plymouth harbor, in order to test, by

means of the excellent cliff sections, the suggestion of the occurrence of such deposits. Pre-Pleistocene deposits were found at Third Cliff, twenty miles southeast of Boston, and possibly at Peaked Cliff, southeast of Plymouth.

The section at Third Cliff shows yellow clays at the base conformably overlain by yellow and white sands and succeeded by a bed of bright red sands with an unconformity at their base. On the eroded edges of the red and white beds are deposited dark, glauconitic and lignitic clays and sands. The entire series of beds has a total maximum thickness of sixty or seventy feet, and outcrops for a half mile along the cliff face. Absolutely no erratic material occurs either within the beds themselves or along the lines of unconformity.

The lithologic characters of the lower beds are like those so persistently characteristic of the Cretaceous from Marthas Vineyard to New Jersey; while the upper beds of dark clays appear to be homologues of the Miocene at Gay Head and at Marshfield. This fact, together with the evidence of the unconformities and of the lignites is being examined with a view toward suggesting probable correlations with the deposits worked out at Gay Head by Professor Woodworth (*Bull. Geol. Soc. Amer.*, VIII., 1897, 197–212); although the absence of specific paleontologic evidence renders such correlation merely tentative. The detailed descriptions of the beds and the conclusions inferred with respect to their age will be published in a later paper.

Isaiah Bowman.

Cambridge, Mass.

Exoglossum in the Delaware.

The occurrence of the little minnow, *Exoglossum maxillingua* (Le Sueur), in the Delaware basin is of interest. So far as I am aware, it has not been taken in any of the tributaries of the Delaware before the capture of two examples which I caught in the Red Clay Creek, Chester County, Pa., during April of 1904. In this instance I am indebted to Mr. Alfred C. Satterthwait, who assisted me in securing the specimens. When first seen, I was under the mistaken impression that they were simply young unmottled examples of *Catostomus commersonnii*.

In the Susquehanna basin this fish is abundant and I have also met with it in tributaries of the Allegheny in Pennsylvania, especially near Cole Grove, in McKean County.

Henry W. Fowler.

Academy of Natural Sciences,
Philadelphia.

SPECIAL ARTICLES.

The Brain of the Histologist and Physiologist Otto C. Lovén.

Professor Lovén, the Swedish histologist and physiologist who will be best remembered for his discoveries of the endings of the taste-fibers in the papillæ of the tongue of mammals, as well as of the vaso-dilator nerves, had expressed it as his wish that his brain be preserved after death and studied by his friend and associate, Gustaf Retzius.

With characteristic care and skill Professor Retzius has just published his studies upon Lovén's brain in *Biologische Untersuchungen*, Vol. XII., 1905. The brain exhibits a richness of fissures and these are marked by a superior degree of tortuousness and ramification. The subparietal region is very complex in its surface configuration, while the central (motor) regions are only moderately developed. The cortical centers for speech and language formation are notably large, and Professor Retzius brings this fact into relation with Professor Lovén's notable powers of clear, exact and logical expressions of thought in words; less so in the way of oratorical *finesse* than in the talented use of the best and most adequate expressions. The weight of the brain is not given in this report though its size is said by Retzius to have been well above the average.

Edw. Anthony Spitzka.

Apples Injured by Sulphur Fumigation.

Recently some injured Esopus Spitzenburg apples were received at the New York Experiment Station with a request to diagnose the trouble. They were of the first grade, each fruit wrapped in paper, and packed in a bushel box. The financial loss was important, as a

considerable amount of high priced fruit had been ruined.

Scattered irregularly over the surface of each apple were conspicuous spots of various sizes where the epidermis was dead, discolored and slightly sunken. Each spot was nearly circular, though on some apples the adjacent spots had coalesced, forming a large affected area of irregular shape. Beneath each spot to a depth of a few millimeters, the flesh was dead, shrunken and dry, appearing as though affected with a dry rot. There was no disagreeable odor or taste to the dead flesh or epidermis.

In the center of each of the smaller spots, and scattered over the larger affected areas, were small bodies resembling the pycnidia of a fungus, but examination showed them to be only the normal lenticels of the apples.

Failure to find either fungi or bacteria as a cause of the injury led to the belief that some treatment of the fruit, such as fumigation, might be a cause. Sulphur, being commonly used for fumigation, was experimented with to note the effects of the fumes upon ripe apples. Fruits of different varieties including Esopus Spitzenburg were placed in a bell jar which was then filled with sulphur fumes. After five minutes the fruit was removed and found to have developed numerous spots that were in every way identical with those on the apples received for examination.

This experiment was repeated many times with wet and with dry fruits, but the characteristic spots were always produced. The spots continued to enlarge for some time after the fruits were removed from the fumes.

The presence of a lenticel in the center of each spot would indicate that the sulphur dioxid passes into the fruit at this point and causes the bleaching of the tissue. A similar effect was produced where an artificial break in the epidermis was made. A lenticel makes a strong color contrast with the bleached epidermis, thus giving it the appearance of a pycnidium.

Sulphur was the only substance used in these experiments; it is possible that other chemicals would produce a similar injury.

GENEVA, N. Y. H. J. EUSTACE.

THE FLOATING LABORATORY OF MARINE BIOLOGY OF TRINITY COLLEGE.

ARTICLES of incorporation have been filed with the secretary of the state of Connecticut 'to establish and maintain a floating laboratory of marine biology for exploration in oceanography and the collection and investigation of the organisms of the sea; to supply colleges, museums and other institutions with material for investigation, study and exhibition.'

A vessel of about ninety tons burden will be secured and equipped with the necessary dredges, trawles, tangles, tow-nets, etc., as well as chemical reagents and glassware for work in marine zoology and botany. When the boat is anchored in a protected harbor immediately it becomes a laboratory. The vessel, in sailing from place to place in the ocean, will furnish most favorable facilities for the investigation of the distribution and variation of organisms. On each expedition it is planned to stay in some particularly desirable locality for about one month so that problems of cytology, embryology and physiology may be undertaken. Competent preparators, artists and photographers will be on the staff so that not only museums and laboratories may be supplied with material, but an effort will be made to meet the specifications of investigators as to fixation and preservation, together with sketches, or photographs, of the organisms desired for their work. In going to a new region each summer large collections for research will be made year after year and it is hoped to greatly extend our knowledge of the local faunæ and floræ of the western Atlantic.

In the early summer of 1906 the vessel will sail to the Bahamas. After a month in the sub-tropics the boat will weigh anchor for the cruise northward, making a harbor every hundred miles or so for the purpose of getting material for comparative studies. In the Bahama Islands the conditions are very favorable for the most abundant and varied organisms since these islands are situated in the mouth of the Gulf Stream where it debouches between Florida and Cuba, bringing with it myriads of creatures caught up in the

wide circuit of the current from the equator and through the Gulf of Mexico. The climate, though warm, is agreeable in summer and usually keeps between 84° and 86°. The trade winds blow steadily, the waters are clear and the people honest and simple hearted. Biological investigators have already found the life there in summer both interesting and delightful. These healthful conditions are of great importance for northern men when working hard with both mind and body on the edge of the tropics.

While this project centers in Trinity College, shares have been taken by those interested in other institutions and it is in the largest way for the benefit of all investigators who care to take advantage of the opportunities offered. CHARLES L. EDWARDS.

FEDERICO DELPINO.

BY the death, at the age of seventy-two, of Professor Federico Delpino, of the University of Naples, modern botany has lost one of its pioneers. For, according to Friedrich Ludwig, a leading authority on the subject, the foundations of plant biology were laid by the publication in 1867 of Delpino's 'Thoughts on Vegetable Biology, on Taxonomy and on the Taxonomic Value of Biological Characters.'

Born at Chiavari, in the province of Genoa, his childhood was largely passed in the garden of his father's house, where he studied closely the habits of ants, bees and wasps and succeeded in discovering the mode in which the great blue-black bee, *Xylocopa violacea,* constructs its nests. His education was the classical one usually given to an Italian boy of that day, and his employment for nearly ten subsequent years was in the routine of the custom house.

About 1864 a friend called Delpino's attention to the account of an English observer of the manner in which a Ligurian orchid was pollinated by *Xylocopa.* Delpino at once replied to his friend that there should be a similar apparatus in the flowers of the Asclepiadaceæ and he hastened to Chiavari to verify this prophecy. Here he quickly found the *Xylocopa* in the act of pollinating the flowers of a magnificent Brazilian asclepiad.

The discovery of the relation between this plant and its insect visitor was a turning point in Delpino's career, for the paper which he promptly published at once put him into relations with the botanical world and marked the beginning of a long series of brilliant researches. Becoming a professional botanist, Delpino taught successively in the universities of Genoa, of Bologna and of Naples.

His predominant interest was always in the relations between plants and animals, but he made valuable researches and thought profoundly on other departments of botany, attacking problems as far away from his chosen subject as phyllotaxy and plant geography.

As a university professor Delpino was probably more feared than loved by his students. No member of the first class which took the final examination in botany at the University of Naples after Delpino's assumption of the instruction in that department will ever forget the wholesale manner in which the failures were recorded. His manner, too, would impress one who met him for the first time as somewhat ascetic. But an experience of almost ten years, of the unvarying courtesy with which Professor Delpino, in frail health and loaded with researches of his own, would respond to every demand for an opinion leads the writer to remember him as no less typical an Italian gentleman than he was an ideal scholar. J. Y. BERGEN.

NAPLES,
May 26, 1905.

THE AMERICAN MICROSCOPICAL SOCIETY.

THE twenty-seventh annual meeting of the American Microscopical Society will be held at Cedar Point (Sandusky), Ohio, on July 5, 6, 7 and 8, 1905. The society will be the guest of the Ohio Lake Laboratory under the direction of Professor Herbert Osborn of Ohio State University who has placed at the disposal of the meeting all the facilities of the laboratory and who is planning excursions and collecting trips to demonstrate the rich fauna and flora of this region. The meetings will be held in the laboratory with the exception of the president's address which will be given in Sandusky.

The general outline of the program shows that Wednesday morning is devoted to business, the afternoon to the reading of papers and the evening to the address of the retiring president, Dr. Henry B. Ward, on 'The Relations of Animals to Disease.' Thursday's program is especially devoted to medical zoology, the morning being given to papers and the afternoon to a symposium, led by the president, on animal parasites, their effects on the hosts, with demonstrations of specimens and microphotographs, and discussion. This evening the society will be tendered a reception. Friday the program includes papers and a symposium on fresh water biology, led by Dr. R. H. Wolcott, covering the field of limnobiology. The evening will be spent on the beach and Saturday will be devoted to excursions.

Summer tourist rates make Sandusky an easy place to reach from all points, and the new hotel, 'The Breakers,' which has been selected as headquarters, insures satisfactory accommodations. There will be at the meeting demonstrations of apparatus and specimens both by firms and individuals. Persons having specimens or photomicrographs of parasites and other forms which they may wish to show can send them to headquarters in care of the officers and they will be duly presented and returned at the close of the meeting.

COLUMBIA UNIVERSITY AND DR. R. S. WOODWARD.

AT its recent commencement exercises, Columbia University conferred the degree of doctor of science on Dr. R. S. Woodward, formerly professor of mechanics and mathematical physics, and now president of the Carnegie Institution of Washington. He was presented by Professor Edmund B. Wilson, head of the department of zoology and Dr. Woodward's successor as dean of the faculty of pure science, who said: "It is a rare distinction to have attained a position of commanding eminence at once in scientific discovery, in scientific teaching, and in the direction of scientific and educational affairs. It is my privilege to present for the honorary degree of doctor of science one whose many-sided achievement has written his name high on the rolls of fame for all of these—Robert Simpson Woodward, for many years the honored and beloved dean of the faculty of pure science, and now president of the Carnegie Institution of Washington. In a distinguished service of more than twenty years under the national government, as engineer of the lake survey, astronomer and chief geographer of the Geological Survey and assistant on the Coast and Geodetic Survey, his varied and profound researches won for him a secure place in the front rank of those who have successfully grappled with the great problems of astronomy and geophysics. For twelve years a professor at Columbia, his work as teacher and investigator in the fields of mechanics and mathematical physics has offered a model of lofty ideals and exacting standards to his fellow students, whether those whom he taught or those who taught with him. As dean of the faculty of pure science he has served Columbia with a conspicuous devotion, loyalty and success that will not be forgotten. His has been the leadership not alone of the eminent scholar and wise counselor, but of the trusted friend, and his example has taught once again the lesson, greater than any in his own large and difficult field of scholarship, that the cause of learning may be advanced as much by the quality of the man as by the achievement of the man of science. As president of the New York Academy of Sciences, of the American Mathematical Society and of the American Association for the Advancement of Science, he has been the far-seeing and eloquent spokesman of science to his fellows. He has now been called to a place of leadership in organized scientific inquiry for which history can not show a parallel. Columbia bids him godspeed, and gladly pays her tribute of honor to one whose life and work have been an honor to her."

SCIENTIFIC NOTES AND NEWS.

THE American Chemical Society met last week at Buffalo under the presidency of Francis C. Venable, of the University of North Carolina.

THE seventh annual meeting of the Astronomical and Astrophysical Society of America

will be held in New York City, December 27–28, 1905.

Dr. William Osler has been made honorary professor of medicine at the Johns Hopkins University. Oxford University has conferred on Dr. Osler the honorary doctorate of medicine.

The University of Michigan has conferred its doctorate of laws on President Henry S. Pritchett, of the Massachusetts Institute of Technology, and the doctorate of science on Professor W. W. Campbell, director of the Lick Observatory.

Dr. Eduard Strasburger, professor of botany at Bonn, has been awarded the gold medal of the Linnean Society of London.

The Society of Arts has awarded its Albert medal to Lord Rayleigh, "in recognition of the influence which his researches, directed to the increase of scientific knowledge, have had upon industrial progress, by facilitating, amongst other scientific applications, the provision of accurate electrical standards, the production of improved lenses and the development of apparatus for sound signaling at sea."

Dr. Henry H. Donaldson, since 1892 professor of neurology at the University of Chicago, has been elected professor of neurology at the Wistar Institute of Anatomy, Philadelphia, having been selected for this position by the advisory board of the institute, consisting of leading American anatomists. Dr. Donaldson will assume his new duties at the institute on October 1, 1905, and will be at the institute during January, February and March. This arrangement will continue for two years, when Dr. Donaldson will be permanently transferred to the institute. Every effort will be put forth to establish a strong corps of neurological workers, as neurology will be the field to which the institute will devote its first attention. An assistant to Dr. Donaldson will be selected by the advisory board.

The departmental committee appointed by the British Board of Agriculture and Fisheries to inquire into the nature and causes of grouse disease has made the following appointments: C. G. Seligmann, Ph.D., bacteriologist to the Zoological Society of London, as bacteriologist to the commission; A. E. Shipley, M.A., F.R.S., lecturer on advanced morphology of the invertebrata to the University of Cambridge, as expert on the subject of internal parasites; H. Hammond Smith, M.D., as assistant bacteriologist and additional field observer; George Clay Muirhead, B.Sc., as field observer.

Sir Archibald Geikie will give the Huxley lecture at Birmingham in 1906.

Oxford University has conferred the honorary degree of doctor of science on Professor E. Ray Lancaster, director of the Natural History Museum, London.

The University of Wales will confer the degree of doctor of science on Sir John Williams, emeritus professor of midwifery at University College, London, and the degree of doctor of letters on Dr. Henry Jones, professor of moral philosophy at the University of Glasgow.

At the commencement and dedicatory exercises of Washington University, St. Louis, June 15, the degree of doctor of laws was conferred on Professor William G. Raymond, dean of the College of Applied Science, State University of Iowa.

Colgate University has conferred the degree of doctor of laws on Professor A. S. Bickmore, in charge of the department of public instruction of the American Museum of Natural History.

Commander R. E. Peary, U.S.N., expects to sail for the Arctic regions on his new ship *The Roosevelt* on July 4.

M. Jean Charcot has returned to Paris from his explorations in the Antarctic regions. He was expected to lecture before the Société de Geographie on June 16 and before the Royal Geographical Society on June 26.

Professor George Frederick Wright, of Oberlin College, will make a geological expedition to southern Russia, returning in January.

The regents of the University of Wisconsin have granted Professor Wm. H. Hobbs leave

of absence for the coming academic year. He will spend some time in study with Professor Ed. Suess at Vienna and with Freiherr Ferdinand von Richthofen in Berlin, in addition to carrying out some geological work in the field.

DURING the summer of 1905, members of the geologic, topographic and hydrographic corps of the United States Geological Survey will be at work in forty-four states and five territories. Mr. C. W. Hayes will have general supervision of field and office work of the division of geology and paleontology, but the investigations in paleontology and stratigraphy will be specially supervised by Mr. T. W. Stanton, those in petrology by Mr. Whitman Cross, those of metalliferous ore deposits by Mr. S. F. Emmons, those in physiographic and glacial geology by Mr. G. K. Gilbert, those of pre-Cambrian and metamorphic rocks by Mr. C. R. Van Hise. The field and office work of the eastern topographic branch will be supervised by Mr. H. M. Wilson, the work of the western topographic branch by Mr. E. M. Douglas. Topographic mapping will be under field and office inspection of Mr. J. H. Renshawe. The supervision of field and office work of the division of triangulation and computing will be in charge of Mr. S. S. Gannett. Mr. F. H. Newell will have general supervision over the work of the hydrographic branch, but the investigations in hydro-economics will be specially supervised by Mr. M. O. Leighton, those in hydrology in the eastern states by Mr. M. L. Fuller and in the western states by Mr. N. H. Darton. The work of measuring streams will be directed by Mr. N. C. Grover.

MR. LE ROY ABRAMS, A.B., A.M. (Stanford), who has held a fellowship in botany in Columbia University during the present year, has been appointed assistant curator in the division of plants of the United States National Museum.

WILLIAM F. KIRKPATRICK has been appointed assistant botanist in the North Carolina College of Agriculture and Mechanic Arts.

DR. J. PAUL GOODE, of the University of Chicago, gave an address on 'Forest Conservation,' before the Federation of Women's Clubs of Kentucky, at Cynthiana, on June 9. At the close of the address a State Forestry Association was organized, with Hon. Robert Worth Bingham, of Louisville, president, Mr. W. M. Reid, of Louisville, secretary, and Col. M. H. Crump, of Bowling Green, treasurer.

THE annual meeting of the Society of Chemical Industry will open on July 10, at University College, London, when the president, Dr. Wm. H. Nichols, will deliver an address.

THE faculty and students of the medical and dental departments of the George Washington University have erected, in the main hall of the department of medicine, a bronze tablet to the memory of their late dean and professor of chemistry and toxicology, Dr. Emil Alexander de Schweinitz.

A MONUMENT in honor of Professor Tarnier was unveiled in Paris, on June 1, and handed over to the city by Professor Brouardel. *The British Medical Journal* states that the monument—which is a high relief by the well-known sculptor, Denys-Pusch—represents Tarnier, in the blouse and apron he wore in hospital, standing at the bedside of a mother who holds her infant in her arms, whilst at the head of the bed is indicated an incubator. An elegant portico by the architect Scellier, of Gison, serves as a frame to the marble, and this decorates the rounded end of the Clinique Tarnier, which faces the Boulevard Montparnasse at the junction of the Rue d'Assas and the Avenue de l'Observatoire. Above the sculpture are the words 'Tarnier, 1828–1897,' while below is the inscription, 'To the Master, who devoted his life to the mothers and infants: his colleagues, his pupils, his friends, his admirers.'

THE deaths are announced of Dr. Franz Pless, emeritus professor of chemistry at Lemberg, at the age of eighty-six years, and of Dr. A. A. Stuckenberg, professor of geology at Kasan.

THERE will be a New York state civil service examination, on July 19, to fill the position of chief of the Bureau of Statistics and Information of the Department of Agriculture, with a salary of $1,500; and of assistant in

photographic chemistry in the Cancer Laboratory at Buffalo, at a salary of $720.

A new pharmacological Institute has been opened at Vienna under the direction of Professor Mayer.

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The Ontario legislature is expected to provide $500,000 for Toronto University, part of which will be used for a university hospital.

Mrs. E. C. Thayer, of Keene, N. H., has given $50,000 to Brown University for general purposes.

Mrs. Thomas F. Ryan has given $50,000 to Georgetown University towards the cost of the new gymnasium.

Dean W. N. Polk, of the Cornell Medical College, has given $15,000 for the establishment of John Metcalf Polk memorial prizes for medical students.

Two traveling scholarships of the value of $1,500 each have been established at the University of Paris for women who intend to become teachers.

The formal dedication of the new physical laboratory at Purdue University took place on May 20. The principal address was by Professor Henry S. Carhart, of the University of Michigan, his subject being 'Some Leaders in Physical Science.'

The School of Applied Science of the State University of Iowa has been reorganized into a college, and the present director of the school, Professor William G. Raymond, has been made dean. A new fireproof building is being erected, and is expected to be in service before the end of this year. Contract has just been let for the building of a dam across the Iowa River below the university grounds. This dam, besides providing a sheet of slack water about two miles long on which the university borders, will provide power for the institution, and for experimental purposes, and will have constructed near one end a canal across which removable dams of various sections will be placed for the study of flow over such structures.

The Rev. Dr. Herbert Walsh Welch has been installed as president of the Ohio Wesleyan University.

Professor E. B. Lovell, of Columbia University, has declined the call to be dean of the College of Civil Engineering of Cornell University, owing to the fact that certain alumni have objected to the appointment.

Professor Charles G. Rockwood has become professor emeritus of mathematics at Princeton University.

Professor George W. Plympton, head of the department of civil engineering in the Polytechnic Institute of Brooklyn, will retire at the end of the academic year.

At the Johns Hopkins University Dr. Florence R. Sabin has been promoted to be associate professor of anatomy. Other appointments in the medical faculty are: Dr. William S. Baer, associate in orthopedic surgery; Dr. Thomas R. Boggs, associate in medicine; Dr. Charles H. Bunting, associate in pathology; Dr. Richard H. Follis, associate in surgery; Dr. William W. Ford, associate in bacteriology; Dr. J. Morris Slemons, associate in obstetrics; Dr. George Walker, associate in surgery; Dr. J. Hall Pleasants, instructor in medicine; Dr. Francis C. Goldsborough, assistant in obstetrics; Dr. Arthur W. Meyer, assistant in anatomy; Dr. Robert Retzer, assistant in anatomy, and Dr. George H. Whipple, assistant in pathology. The two university fellows in pathology and physiology are Drs. Ernest K. Cullen and J. A. E. Eyster.

Mr. Wm. Harper Davis, instructor in philosophy and psychology at Lehigh University, has been elected assistant professor, in charge of the department.

Dr. E. L. Norton, of the University of Wisconsin, has been appointed instructor in philosophy at Adelbert College.

Appointments at Yale University have been made as follows: Seth E. Moody, Howard D. Newton, Carl O. Johns and Paul M. Butterfield, assistants in chemistry; Dr. C. B. Rice, instructor in applied electricity; Luther C. Weeks, assistant in mathematics; Philip H. Mitchell, assistant in physiological chemistry.

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